APPROVED MEETING MINUTES
SOUTH CAROLINA SHORELINE CHANGE ADVISORY COMMITTEE
Topic: Research and Information Priorities
January 25, 2008 – 9:00am-5:00pm

This document is not intended to be a meeting transcript, *per se*. It is a summary of key themes and some (though not all) of the background dialogue. The meeting summary's structure roughly parallels that of the meeting agenda but is not necessarily true to the temporal order of discussion. A digital recording of the meeting is located at SCDHEC-OCRM's Charleston office.

In Attendance:

1) Advisory Committee members:

Jeff Allen,	Clemson University
Sara Brown,	U.S. Army Corps of Engineers
Mark Caldwell,	U.S. Fish & Wildlife Service – *alt. for Tim Hall*
Jimmy Carroll,	Carroll Realty
Mary Conley,	The Nature Conservancy
Paul Conrads,	U.S. Geological Survey
Rick DeVoe,	S.C. Sea Grant Consortium
Kirstin Dow,	University of South Carolina
Emily Dziuban,	City of Isle of Palms – *alt. for Linda Tucker*
Josh Eagle,	University of South Carolina
Paul Gayes,	Coastal Carolina University
Bob George,	G. Robert George & Associates, Inc.
Ben Gramling,	Gramling Brothers, Inc.
Scott Harris,	College of Charleston
Norm Levine,	College of Charleston
Jim London,	Clemson University
Chris Mack,	Dewberry, Inc.
Tara Miller,	NOAA Coastal Services Center – *alt. for Jeff Payne*
Jim Morris,	University of South Carolina

2) Guest Speakers:

Doug Marcy,	NOAA Coastal Services Center

3) S.C. Department of Health & Environmental Control:

Marvin Pontiff,	OCRM Assistant Deputy Commissioner
Braxton Davis,	OCRM Science & Policy Director
Barbara Neale,	OCRM Regulatory Director
Bill Eiser,	OCRM Staff Oceanographer
Melissa Rada,	OCRM Science & Policy Program Coordinator
Sadie Drescher,	OCRM Science & Policy Researcher
Mark Messersmith,	OCRM Science & Policy Researcher
Matt Slagel,	NOAA Coastal Management Fellow

4) S.C. Office of Human Resources

Nathan Strong,	Facilitator

5) S.C. Shoreline Change State of Knowledge Report Contractors:

Ross Nelson,	Tidewater Environmental Services, Inc.; Charleston, SC
John McCormick,	Coastal Risk Tech; Wilmington, NC

Welcome and Introductions:

Braxton Davis, Director of OCRM's Science & Policy Division, provided a brief overview of the Shoreline Change Initiative and the purpose of the Advisory Committee. The Committee approved the minutes from the meeting on November 30, 2007 (the final minutes are now posted on the Shoreline Change Advisory Committee website). Dr. Davis then introduced Ross Nelson and John McCormick to the group. Mr. Nelson (Tidewater Environmental Services, Inc.) and Mr. McCormick (Coastal Risk Tech) are working on the Shoreline Change State of Knowledge Report with input from the Committee. The goals of the report will be to synthesize existing information and guide future research and data collection efforts regarding shoreline change in South Carolina.

Presentations:

The following presentations are available on the Shoreline Change Advisory Committee website: http://www.scdhec.gov/environment/ocrm/science/shoreline_comm_0108.htm

Beach Monitoring & Coastal Erosion Studies in South Carolina
Dr. Paul Gayes, Coastal Carolina University

The purpose of the S.C. Coastal Erosion Study was to develop a complete understanding of the factors controlling sediment transport in order to predict coastal change throughout the Grand Strand, from Little River Inlet to Winyah Bay. Numerous cooperating agencies and institutions worked on the study, including the U.S. Geological Survey, S.C. Sea Grant Consortium, Coastal Carolina University, College of Charleston, and the University of South Carolina. The study characterized the offshore and onshore geologic framework of the Grand Strand through the use of Side Scan Sonar, Interferometric Sonar, surficial sediment samples, vibracores, bottom video, borings, and ground penetrating Radar. It is important to know where sand exists on a regional basis for potential borrow sites for renourishment. Offshore of Myrtle Beach, about 50% of the area is hard bottom communities, with only a thin veneer (about 1 meter thick) of sand in some locations. There is also a need for sufficient historical shoreline positions so that erosion rate studies and calculations can be performed. For example, it is not appropriate to assume that shoreline position stayed the same for 80 or 100 years without intervening positions. It is also necessary to survey and study contours and profiles of both the upper and subaerial beach since armored beaches can still erode. Since 1993, the BERM (Beach Erosion Research and Monitoring) program has used shore-perpendicular surveys to document annual change within the active beach system from the dunes to the inner continental shelf. Integrating truck mounted LIDAR with Multibeam Sonar is currently being explored as a means to generate surfaces instead of profiles or lines in the study of beach morphology changes. Beach cameras provide a good view of nearshore sandbar configuration since breaking waves produce a foam line in the position of the bars. The U.S. Army Corps of Engineers Grand Strand Beach Renourishment Study is ongoing and seeks to determine the physical and biological response to the renourishment project. Beach fill areas, borrow sites, and nearshore reefs are being monitored.

Dr. Gayes believes some future research issues that need to be addressed include:

- Monitoring coastal erosion as surfaces instead of lines
- Determining dispersal pathways of sediment and establishing sediment budgets
- Integrating inlets in monitoring
- Mapping sand resources and habitats for other areas
- Modeling storm surge
- Increasing modeling and predictive capabilities
- Analyzing relative sea level rise and adaptation and how this relates to water quality, economics, and policy

Question and Answer session with Dr. Paul Gayes:

Q- Are sand quantity data available for recent renourishments?
A- Yes, the volumes placed and the volumes taken from the borrow site are available from the U.S. Army Corps of Engineers.

Q- When people apply for a renourishment permit, do they provide an estimate of the project life expectancy based on modeling or some other analysis tool?
A- Yes, the U.S. Army Corps of Engineers performs modeling and erosion rate analyses before a project, and they find borrow sites with 50 year sand supplies that don't threaten critical habitat areas.

Q- If one jurisdiction takes sand from offshore, it's not available to adjacent communities. Is this a problem?
A- Yes, we are not managing sand as a resource for the long-term.

Shoreline Inventories and Applications
Dr. M. Scott Harris, College of Charleston

It is important to have a common shoreline definition so that researchers, scientists, and managers reference the same feature. Numerous shoreline data sources exist including historical charts (T sheets), beach surveys, aerial photographs, GPS surveys, video imaging, and LIDAR. The most common method of obtaining shoreline position is to digitize the wet/dry line from rectified aerial photographs. The Cyrix 3D laser scanner can be used to compare different sets of profile data and perform volumetric analyses of beach morphology change. The Profile Management and Analysis System (PMAS) is an online database where the profile data from the BERM project are stored. The regional profile data are distributed through OCRM's State of the Beaches Report each year, and the online database includes legislative setback design tools and shoreline change analysis tools.

Dr. Harris believes some future research issues that need to be addressed include:

- True analysis of data coverage needs
- Periodic and reliable data sets

- Additional compilation of all publicly funded shoreline data and analyses
- Encourage access to privately funded data for scientific analysis
- Encourage collaboration between public and private sector

Question and Answer session with Dr. Scott Harris:

Q- In the 1987 Blue Ribbon Committee report, 57 miles of shoreline were classified as "critically eroding." How was this determined?
A- None of the Committee members are familiar with how this was determined.

Q- Do you have any recommendations for defining the shoreline?
A- The vegetation line, dune crest, wet/dry line, and low tide line have all been used in the past, but the wet/dry line can be obtained from the most data sets and it is fairly consistent.

Q- Relative sea level rise and absolute sea level rise are two different things. Is anyone looking at relative sea level rise and subsidence?
A- Aquifer draw-downs need to be examined as they relate to subsidence.

Physical and Biological Changes along Estuarine Shorelines
Dr. Jim Morris, University of South Carolina

Sea level rise is not constant, but sea level is rising faster now than it was historically. The fourth Intergovernmental Panel on Climate Change assessment predicts a sea level rise of 15 to 23 inches by the end of the 21st century, but some feel that this is a conservative estimate. In marshes, Sediment-Elevation Tables (SETs) can be used to monitor changes in the elevation of the marsh surfaces – current experiments are also examining sea level responses of marsh plants in control and fertilized plots. SETs are used at North Inlet, and Dr. Morris believes it would be useful to place them elsewhere and to automate the monitoring process. Based on Dr. Morris' research, sediment accretion is a function of biomass density on the marsh surface and flood frequency and duration. The marsh surface elevation increases as the rate of sea level rise increases, up to a certain "tipping point." For example, the marsh at North Inlet would be unable to keep up with a rise in sea level of 0.8-1.0 cm/yr. The current rate of sea level rise is about 0.3 cm/yr for the period 1993-2003. Salt marshes will also migrate inland as sea level continues to rise, where possible. Given the average slope of the S.C. coastline, (150 feet of rise over a distance of 75 miles), if the marshes accrete 0.8 cm/yr, they may migrate a distance of 2 kilometers or 1.2 miles in 100 years. There are management implications in terms of the extent of marsh that could be lost due to sea level rise.

Question and Answer session with Dr. Jim Morris:

Q- If we used a setback along estuarine shorelines, how far should the setback distance be from the marsh edge?

A- About ½ mile of setback would be appropriate, based on the rate of potential marsh migration landward. Planning for marsh migration then becomes a socio-economic question.

Q- Do marshes only migrate once the 0.8 cm/yr rate of sea level rise is reached?
A- No, marshes migrate now, even with only 0.3 cm/yr rate.

Q- What is the current rate of landward marsh migration?
A- You could begin to estimate based on current sea level rise (0.3 cm/yr) * the slope of the adjacent uplands, depending on what's on those adjacent uplands.

Q- Where does the current sea level rise rate of 0.3 cm/yr come from?
A- This is the rate of rise at the Charleston Harbor tide gage.

Q- Are there any marsh migration rate data available?
A- No, but LIDAR data of coastal wetland elevation would help to acquire it.

Comment- Applied Technology and Management performed a shoreline evaluation of Charleston Harbor using historical aerial photographs, and they determined that very little change in marsh areas had occurred historically. (OCRM staff will try to locate this study for the Committee)

Engineering Perspectives on Research and Information Needs
Chris Mack, P.E., Dewberry, Inc.

Good coastal engineering designs promote balanced solutions predicted on good information and research. Decisions must be defendable, with quantitative estimates, to be effective and appropriate. More data is needed on winds, waves, and water levels- those forces that cause sediment transport and change and shape the beach. Complete sets of observed gage records lead to applied and better design than theoretical observations. It is essential to know where sand is coming from, where it is going, the rate of transport, the volume that is moving, and the impacts. Annual or bi-annual aerial photography is a valuable tool because it provides insight into large-scale system behavior and the forcing-response "signature" of the shoreline. LIDAR is another tool that is frequently used in shoreline change analysis, storm surge modeling, sediment transport modeling, hazards mapping, and post-storm damage assessments. Coastal engineers frequently use the profile data that are collected by the BERM program. A database or digital inventory of the impacts and lessons learned from different shoreline management strategies would help clarify why a certain approach was or was not effective. Old approaches must be discarded for new solutions that work with the natural systems to restore or preserve natural features. Mr. Mack believes some future research needs include:

- More wave gages, particularly in nearshore regions
- Better desktop models for predictive analyses and designs
- Systems approach to sediment budgets
- Periodic surveys of inlets and ebb shoals

- Beach, inlet, and shoreline management studies and plans
- Annual or bi-annual aerial photography (not necessarily ortho-rectified)
- Annual ortho-rectified aerial photographs and LIDAR data collection (joint collection with multi-agency funding and support)
- Active monitoring program, including complete sediment samples and grain size analysis of beaches
- Identification of long-term future sources of beach compatible sand

Question and Answer session with Mr. Chris Mack:

Q- Are there wave gage data off the coast of South Carolina?
A- Dr. Paul Gayes and Dr. George Voulgaris (USC) have collected wave data for about 3 years off Myrtle Beach and Folly Beach.

NOAA Shoreline Information Resources
Doug Marcy, NOAA Coastal Services Center

The NOAA Coastal Services Center (CSC) has many shoreline information resources. The Beach Nourishment Guide can help state and local organizations to make informed decisions about beach nourishment by providing information on coastal geology, socioeconomics and policy, and engineering. NOAA CSC held two shoreline change conferences in 2002 and 2006 to foster dialogue among researches and coastal managers and to explore policy, planning, and regulatory approaches to managing shoreline change. The NOAA OCRM Shoreline Management Technical Assistance Toolbox provides tools and information focusing on alternative shoreline stabilization methods and the economics of shoreline management. NOAA CSC has scanned 14,000 T-sheets into digital format, and the vectorized MHW line on these charts can be used to measure erosion. Cartographic shoreline composites and metadata also exist for the lower 48 states. South Carolina coastal LIDAR data is available for most of the beachfront, Jasper County, Colleton County, and parts of Charleston County. The data can be downloaded and manipulated using the LIDAR Data Retrieval Tool (LDART) and the LIDAR Data Handler within ArcGIS. South Carolina coastal land cover data is available for 1990, 1995, 1996, and 2001, and land cover change data is available from 1990-1995 and 1996-2001. The change data shows impacts of land use and development on ecosystem health. Another CSC resource is the Habitat Priority Planner, which provides habitat classification data and habitat analysis tools for determining habitat quality and connectivity. Some current CSC initiatives include the launch of the One-NOAA Shoreline website in summer of 2008, the expansion of the NOAA Shoreline Data Explorer, and the start of a Charleston sea-level rise pilot project with PlaceMatters. Risk increases as the probability of a negative consequence increases. Risk based maps depict results of probabilistic modeling and try to determine consequences, event based maps depict observed flooding or other impacts, and scenario based maps depict output from predictive models. Shoreline change has an effect on the validity of all coastal inundation map products because as the shoreline changes position, flood hazards change also. Mr. Marcy believes some future research issues that need to be addressed include:

- Cumulative hazards – shoreline erosion is one of many factors that should be considered, but not the only one
- Mapping risk is a potential way to determine spatially in which areas should the level of risk be retained, transferred, reduced, or avoided
- Mapping future conditions is necessary
- Assess period of record in light of climate change – Is looking at the past 40 years good enough?
- Consider other methodologies for baseline and setback line revisions based on more rigorous engineering methods

Question and Answer session with Mr. Doug Marcy:

Q- Can the CSC land cover data be downloaded into ArcGIS?
A- Yes.

Q- Is VDatum relevant to this discussion?
A- Yes, VDatum is a good tool also – it transforms between different vertical datums, but it is available only in certain places where a tidal model exists.

Breakout Group Discussions:

The Committee members were divided into three groups to discuss research priorities and information needs in the following four categories:

1) Shoreline Positions and Monitoring
2) Sediment Budgets and Erosional Forcing
3) Future Projections and Models of Shoreline Change
4) Natural Resources and Community Vulnerabilities

The Committee determined that the following are the most pressing needs in each of the four topic areas, in no particular order.

Synthesis of Breakout Group Results and Prioritization:

Shoreline Positions and Monitoring:

- A statewide, systematic, interagency LIDAR and aerial imagery initiative and clearinghouse
- Historic and current digital marsh/estuarine shorelines, monitoring of estuarine shoreline change, and marsh migration
- A shoreline inventory and classification system; see links below:
  - http://dcm2.enr.state.nc.us/Hazards/EWG%20Final%20Report%20082106-1.pdf
  - http://ccrm.vims.edu/gisdatabases.html
- Focus monitoring on event-based, opportunistic sampling and erosion hotspots (above, below surface)

- Common standards for shoreline definitions
    - Evaluate which shoreline definitions/datums should be used for regulatory purposes in S.C.
    - Evaluate methodologies for monitoring and calculating long term erosion rates
- Sustain the Beach Erosion Research and Monitoring (BERM) program

Sediment Budgets and Erosional Forcing:

- Better understanding of sediment transport (cross-shelf, inlets, and along-shore)
- Wave monitoring (e.g. HF Radar) and generation of "coastal climatologies," including waves, surface currents, winds, storm frequencies, etc.
- Additional geological framework studies for the rest of the coast, including areas out to 5 miles offshore and marshes
    - Also include positions of historical inlet/ river channels, etc.
- Research and monitoring of riverine/estuarine sediment dynamics and anthropogenic effects

Future Projections and Models of Shoreline Change:

- Integrate natural and socioeconomic models of shoreline change – e.g. growth, development, and sea level rise
- Improved models that predict coastal wetland and beach erosion, migration, and vertical accretion in response to elevated sea level rise scenarios
- Improved models of inlet processes and dynamics
- Clarifying uncertainties with respect to shoreline positions, reference datums, and projections

Natural Resources and Community Vulnerabilities:

- Improved maps of natural, cultural, and economic resources in close proximity to beachfront and estuarine shorelines – e.g. parcel maps, property values, and habitats
- Planning/decision support tools for communities; quantifying risk and vulnerabilities, mitigation plans, historic shorelines/erosion rates, renourishment projects, infrastructure, etc.
- Risk mapping using modeled scenarios for prioritizing resources
- Economic assessments of the costs of enforcing the retreat policy, establishing a "tipping point" for renourishment by location, or making decisions from wrong projections

[FULL LISTING of Breakout Group Ideas]

Shoreline Positions and Monitoring:

GROUP 1:

- Keep Beach Erosion Research and Monitoring (BERM) program in place, and combine with LIDAR and Multibeam Sonar data acquisition
- LIDAR, orthorectified aerial imagery, Multibeam Sonar
    - Beachfront LIDAR 2x/yr; estuarine 1x every 5 years
- Official S.C. definition of shoreline (legal / beachfront management)
- Historical marsh shorelines

GROUP 2:

- Shoreline positions for sheltered coasts
- Integrated annual statewide data collection (LIDAR, beach profiles, aerial photography) and clearinghouse
- Coastal classification system

GROUP 3:

- Focus more on event-based monitoring and erosion hotspots
- Migration rates of marsh
- Systematic (2 & 6 year) LIDAR / imagery for entire coast
    - Imagery needs metadata (existing and historic metadata generation when possible
    - Need multispectral and hyperspectral, at least 1 meter resolution
    - Need state standard for shoreline geospatial data
- More "quick and easy" monitoring with photos and video
- Move towards surfaces and not lines for monitoring coastal erosion

Sediment Budgets and Erosional Forcing:

GROUP 1:

- Additional geological framework studies for the rest of the coast, including areas out to 5 miles offshore and marshes
    - Also include positions of historical inlet/ river channels, etc.)
- HF radar to obtain surface water movement and wave pattern data

GROUP 2:

- Geophysical characterization of offshore S.C. coast (ongoing monitoring)
- Nearshore wave height data and associated climate data
- Temporary, deployable system for monitoring storm impacts on erosional patterns

GROUP 3:

- Sediment concentrations in coastal rivers
- Better understanding of sediment transport (cross-shelf, inlets, and along-shore)
- Wave climate monitoring; nearshore and coastal climatology (waves, surface currents, winds, etc.)
- High resolution marsh elevations (SETs) / beachfront bathymetry (Multibeam Sonar)
- Links between sea level rise and erosion rates
    - http://www.epa.gov/climatechange/effects/coastal/index.html
    - http://www.cop.noaa.gov/stressors/climatechange/current/sea_level_rise.html

Future Projections and Models of Shoreline Change:

GROUP 1:

- Need to decide on the time frames we should be projecting to (30-yr mortgage, 40-yr setback, 100-yr sea level rise)
- Approach modeling from both anthropogenic (growth projection, land use) and natural systems (relative sea level rise, climate systems) perspectives
- Better shoal by-passing and inlet modeling

GROUP 2:

- Model geophysical processes and response to sea level rise
- Model impacts of coastal development and sea level rise on sheltered shorelines
- Model storm erosion relationship for entire S.C. coast and link to wave climate data

GROUP 3:

- Need coastal development and growth models
- How should we calculate long-term erosion rates?
    - Rather than compare 1850 to modern shoreline, could we measure dune transgression over the past 40 years?
- Improved models that predict coastal wetland and beach erosion, migration, and vertical accretion in response to elevated sea level rise scenarios

Natural Resources and Community Vulnerabilities:

GROUP 1:

- Need good map of natural resources coast-wide; both geology and ecology
- Identify natural resources and community assets at risk, quantify risk, and develop mitigation plans
- Communicate, educate, and disclose risk

GROUP 2:

- Develop tools for communities to develop/manage options for considering ecosystem and shoreline impacts
- Inventory public and private property, historic, and habitat types and areas
- Coastal hazard risk mapping of future conditions for prioritizing resources

GROUP 3:

- Improved access to parcel maps and property values data
- Natural resource inventories
- Economic costs of retreat policy
    - Market/non-market values lost/gained – retreat vs. armoring
- Economic tipping point for renourishment by location
- Economic risk of wrong projections

Public Comment Period:

Mr. Dennis Nolan of the Harbor Island Beach Preservation Committee addressed the Shoreline Change Advisory Committee. He believes that the State needs to be a model of best management practices in shoreline management, and was upset when Hunting Island was allowed to renourish its beach and add groins. In his opinion, Hunting Island would have been an ideal place to demonstrate the State's retreat policy since much of the island is State-owned land. There are allegations that the recently constructed groins are exacerbating erosion on the southern end of the island, so Hunting Island is seeking to renourish the beach in this eroded area. The department of Parks, Recreation, and Tourism (PRT) wants to use sand from the north and south spits that have accreted on Hunting Island since this sand source is cheaper than an offshore source, but Mr. Nolan believes that this is important turtle nesting habitat and a source of sand for Harbor and Fripp Islands. He also believes that PRT is not looking at the sand source issue from a regional perspective but simply wants to ease the political pressure it is feeling.

Mr. Rob Rettew of the Hunting Island Beach Preservation Association also addressed the Committee. He submitted before and after photographs of the erosion that has occurred at

the southern end of Hunting Island from 2006 to present. These photographs can be viewed on the Committee website at the following link:
http://www.scdhec.gov/environment/ocrm/science/shoreline_comm.htm
No additional cabins have been abandoned or torn down since he spoke to the Committee at the November 30, 2007 meeting, but some have had their water and sewer lines disconnected as a result of the erosion. In reference to Mr. Nolan's comments, Mr. Rettew noted that there is a difference between shoals and sand spits as sources of sand. Mr. Rettew is unaware of many wave refraction studies in South Carolina, and he mentioned that Tim Kana, a consultant who worked on the Hunting Island groin and renourishment project, said that money could not be spent on wave studies before the project. Also, Mr. Rettew believes that such wave studies are mandatory in North Carolina before beach nourishment or shore protection projects are commenced. He noted that retreat is not possible for the Hunting Island cabins because there is no place for them to go. In 1938, two doctors from New York sold their Hunting Island property to the State, and the deed states that the property was 50 acres, close to shore, with 10-year leases.

Mr. Doug Marcy of NOAA CSC commented that Lisa Jones at the state Department of Natural Resources (DNR) is researching past storm tracks, and a risk mapping process could begin based on this probability data.

Future Meeting Schedule:

Next meeting: Beachfront Retreat Policy; February 21, 2008
Place: Oscar Frazier Community Center, Bluffton, SC
Format: Meeting during day, followed by public comment period

Next Steps and Agreements:

1) The next meeting, "Beachfront Retreat Policy," will take place on **February 21, 2008** in Bluffton. This meeting will be followed by a public comment period.

2) A date for the fifth meeting has not yet been finalized, but this will be done over email.

3) Committee members who arrived late to the meeting are encouraged to get in touch with OCRM to listen to the full audio transcript, which is available in OCRM's Charleston office.

4) Submitted written public comment materials will be distributed to Committee members. Oral public comments are described in the meeting minutes. All public comments will be available in full at OCRM's Charleston office.

5) Prior to the next meeting, OCRM will send the Committee some "homework" reading materials, an agenda for the February 21 meeting, potential dates for future meetings, and draft meeting minutes so that these items may be reviewed.

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Template: C:\Documents and Settings\burgerdj.000\Application Data\Microsoft\Templates\Normal.dot
Title: MEETING SUMMARY
Subject:
Author: slagelmj
Keywords:
Comments:
Creation Date: 2/25/2008 10:29 AM
Change Number: 2
Last Saved On: 2/25/2008 10:29 AM
Last Saved By: slagelmj
Total Editing Time: 5 Minutes
Last Printed On: 2/25/2008 11:04 AM
As of Last Complete Printing
Number of Pages: 12
Number of Words: 4,129 (approx.)
Number of Characters: 23,540 (approx.)